



US005197340A

United States Patent [19]

Jones

[11] **Patent Number:** **5,197,340**[45] **Date of Patent:** **Mar. 30, 1993****[54] METHOD AND APPARATUS FOR SAMPLING LIQUID**

[76] **Inventor:** **Richard W. Jones, Warren Jones**
Engineering Limited, 120-124
Churchill Rd., Bicester, Oxfordshire
OX6 7XD, United Kingdom

[21] **Appl. No.:** **687,886**[22] **PCT Filed:** **Oct. 2, 1990**[86] **PCT No.:** **PCT/GB90/01509**§ 371 Date: **Jul. 31, 1991**§ 102(e) Date: **Jul. 31, 1991**[87] **PCT Pub. No.:** **WO91/05234****PCT Pub. Date:** **Apr. 18, 1991****[30] Foreign Application Priority Data**

Oct. 2, 1989 [GB] United Kingdom 8922118
Mar. 30, 1990 [GB] United Kingdom 9007189

[51] **Int. Cl.⁵** **G01N 1/14**[52] **U.S. Cl.** **73/864.35**[58] **Field of Search** 73/863.1-863.3,
73/863.84, 863.85, 864.34, 864.35**[56] References Cited****U.S. PATENT DOCUMENTS**

3,209,598 10/1965 Anderson et al. 73/864.35
3,587,670 6/1971 Brailsford 73/864.35
3,589,197 6/1971 Brooks, Sr. .
3,691,844 9/1972 Moore .
3,901,087 8/1975 Hannes Fabritius .
4,037,472 7/1977 Gates 73/864.35
4,163,392 8/1979 Fleenor et al. 73/864.35
4,418,581 12/1983 Jones .

OTHER PUBLICATIONS

Patent Abstracts of Japan, vol. 10, No. 327, P513, ab-

stract of JP 61-133835, publ. Jun. 21, 1986 (Fuji Electric Co., Ltd.).

Primary Examiner—Robert Raevis
Attorney, Agent, or Firm—Davis, Bujold & Streck

[57] ABSTRACT

A method of, and apparatus for, liquid sampling by way of a self contained unit for: 1) the periodical coupling of a pressurizable sample chamber to a source of sub-atmospheric pressure to cause a bulk sample of liquid for sampling to be drawn into the chamber from a body of liquid by a first passage; 2) the retention of a sample volume thereof in the chamber while allowing surplus liquid from the bulk sample to drain from the chamber by way of the first passage; and 3) allowing the retained sample volume to pass out the chamber by way of a second passage under the control of a delivery valve wherein the periodical coupling of the sample chamber to a source of sub-atmospheric pressure is undertaken by way of a valve system comprising first and second flexible tubes, the first flexible tube linking a source of air at super-atmospheric pressure to the chamber and the second tube linking a source of air at sub-atmospheric pressure to the chamber; and a first clamping device in the form of a cam which can, depending on the disposition of the cam, alternately: 1) distort the first tube to prevent the chamber from communicating with the sub-atmospheric source while allowing the chamber to communicate with the super-atmospheric source by way of the second tube; and ii) distort the first tube to prevent the chamber from communicating with the super-atmospheric source while allowing the chamber to communicate with the sub-atmospheric source by way of the second tube.

6 Claims, 4 Drawing Sheets